Topic 12: Atomic structure (3 hours)

12.1 Electron configuration

3 hours

	Assessment statement	Obj	Teacher's notes
12.1.1	Explain how evidence from first ionization energies across periods accounts for the existence of main energy levels and sub-levels in atoms.	3	**TOK:** Which ways of knowing do we use to interpret indirect evidence? Do we believe or know of the existence of energy levels?
12.1.2	Explain how successive ionization energy data is related to the electron configuration of an atom.	3	**Aim 7:** Spreadsheets, databases and modelling software can be used here.
12.1.3	State the relative energies of s, p, d and f orbitals in a single energy level.	1	**Aim 7:** Simulations can be used here.
12.1.4	State the maximum number of orbitals in a given energy level.	1	
12.1.5	Draw the shape of an s orbital and the shapes of the p_x, p_y and p_z orbitals.	1	**TOK:** The breakdown of the classical concepts of position and momentum is another example of the limitations of everyday experience. The need for a probability picture at the atomic scale shows that human knowledge is ultimately limited.
12.1.6	Apply the Aufbau principle, Hund's rule and the Pauli exclusion principle to write electron configurations for atoms and ions up to $Z = 54$.	2	For $Z = 23$, the full electron configuration is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$ and the abbreviated electron configuration is $[Ar]4s^2 3d^3$ or $[Ar]3d^3 4s^2$. Exceptions to the principle for copper and chromium should be known. Students should be familiar with the representation of the spinning electron in an orbital as an arrow in a box.